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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 065625

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

PROCESSOR, SOLID PROPELLANT (chem.) 6-52.773

B-556 or S-279

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U. S. Employment Service
in Cooperation with
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TM 001 925

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

PROCESSOR, SOLID PROPELLANT 6-52.773

B- 556

Summary

The General Aptitude Test Battery was administered to a final sample of 59 men employed as Processors, Solid Propellant 6-52.773 at the Thiokol Chemical Corporation, Karnack, Texas. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception, Q-Clerical Perception and M-Manual Dexterity were selected for inclusion in the final test norms.

GATB Norms for Processor, Solid Propellant 6-52.773, B-556

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	70	P	Part 5 Part 7	70
Q	CB-1-B	75	Q	Part 1	80
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that only 66 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 86 percent would have been good workers. 34 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 14 percent would have been poor workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Processor, Solid Propellant (chem.) 6-52.773

II. Sample

The GATB, B-1001, was administered during July and August 1962 to 64 men employed as Processors, Solid Propellant (chem.) 6-52.773 at the Thiokol Chemical Corporation, Karnack, Texas. The company employs approximately 77 Processors at this plant. Of the 64 workers tested, five individuals were eliminated from the final sample because of invalid test results. Therefore, the final sample consisted of 59 men.

The minimum training time for Processors, Solid Propellant is sixty days from the date of hiring. All individuals in the final sample are considered experienced.

The Wonderlick Personnel Test, Form A and the Flanigan Aptitude Classification Test, 5A, 7A and 8A were administered in the employment process, but no specific norms were used in selecting individuals for employment.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

N = 59	M	σ	Range	r
Age (years)	32.2	7.1	23-53	-.266*
Education (years)	11.8	1.1	7-15	.271*
Experience (months)	56.1	17.1	5-87	.106

*Significant at the .05 level

III. Job Description

Job Title: Processor, Solid Propellant (chem.) 6-52.773

Job Summary: Assembles and loads a wide variety of solid propellant rocket motors. Cleans, blasts and lines motor cases; weighs and mixes chemicals and casts (pours) mixtures into cases; cures motors in ovens; cleans, coats and removes casting cores; trims charges; assembles cases, nozzles, ignition cables and articulation shrouds; and paints and packs motors into pressurized shipping cartons.

Work Performed: Degreases and sandblasts motor cases; mixes lining material and sprays inside of case to coat it. Weighs, mixes and colloidizes various liquid and dry chemicals into a "base" mixture for solid propellants according to manufacturer's instructions. Mixes specified prepared base materials with dry materials in a rotary-type mixer, to form a slurry-type propellant mixture, using remote control panel, charts and closed circuit television camera and screen..

Positions motor case in rack or pit; sets and aligns core; attaches vibrator; attaches hose line to transfer can; fills case with propellant from bottom or top, using flex valves and air pressure to control flow.

Paints small motor cores with release compound; mounts and pressurizes fuel transfer cans; assembles and connects manifolds, casts (fills) cases with propellant, inserts and aligns cores, vibrates cores into position, transfers filled cases to curing ovens. Aligns and bolts retainer rings and nozzle adapter with torque wrenches. Sands and repaints case with paint spray gun. Pulls cores from small cured motors, removes casting sleeves and cuts projecting propellant from case. Screws on adapter ring and nozzle, and checks alignment of nozzle and case on alignment machine. Cleans inserts and aligns cores, vibrates cores into position, and transfers filled cases to curing ovens.

Heat cures slurry-filled motors through a series of specified cam-controlled timed temperature changes to condition and solidify propellants. Uses remote controlled hydraulic jack to remove core from cast propellant. Removes casting sleeve and trims excess propellant and paints motor and packages with igniters in shipping cans.

Bolts and safety wires nozzles to adapter rings, bolts and safety wires igniter motors, sets and bonds clips and wiring harnesses, and bolts and assembles articulation skins and reversal tubes to cases. Obtains longitudinal and radial centers of gravity. Touches up paint and packs motors into pressurized sealed shipping cases. Stencils specified information on containers.

Prepares sample and tests motors for firing tests. Conditions motors in ovens and cold room, aligns motors on test racks for tests. Records weights and other data from fired motors. Disassembles, examines, cleans and salvages parts.

Uses a variety of equipment such as surveyors, transits center of gravity machines, ohm meters, hoists, fork-lift trucks, blasting machines and mixing machines.

IV. Experimental Battery

All the tests of the GATB, B-1001, were administered to the sample group.

V. Criterion

The criterion data collected consisted of two sets of independent ratings made by the first and second-line supervisors on USES Form SP-21, "Descriptive Rating Scale." A period of at least two weeks elapsed between the first and second ratings. The rating scale consisted of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliabliity coefficient of .85 was obtained for the criterion. Therefore, the two sets of ratings were combined, resulting in a distribution of final criterion scores of 34-84 with a mean of 60.7 and a standard deviation of 10.5.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this occupation:

Intelligence (G) - required in understanding manufacturer's written instructions and operating procedures.

Clerical Perception (Q) - required in reading and recording temperatures, mixture pressures and weights, as well as reading various dials and gauges.

Aiming (A) - required in operating fork lifts, dollies and hoists.

Finger Dexterity (F) - required in setting gauges and dials and in the use of small instruments.

Manual Dexterity (M) - required in the use of tools, mixing chemicals and in the movement of parts and equipment.

On the basis of the job analysis data, aptitudes V-Verbal Aptitude and T-Motor Speed were rated"irrelevant" for success in this occupation.

B. Quantitative Analysis:

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N=59

TABLE II

Aptitudes	M	σ	r
G-Intelligence	105.2	17.4	.481**
V-Verbal Aptitude	98.3	13.0	.488**
N-Numerical Aptitude	101.7	18.4	.530**
S-Spatial Aptitude	106.4	19.1	.238
P-Form Perception	99.0	17.2	.423**
Q-Clerical Perception	88.3	14.2	.473**
A-Aiming	90.6	19.7	.230
T-Motor Speed	90.3	17.0	.298*
F-Finger Dexterity	98.6	16.7	.234
M-Manual Dexterity	102.0	19.4	.304*

*Significant at the .05 level
**Significant at the .01 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes									
	G	V	N	S	P	Q	A	T	F	M
Job Analysis Data										
Important	X					X	X		X	X
Irrelevant		X						X		
Relatively High Mean	X		X	X						X
Relatively Low Sigma		X				X				
Significant Correlation with Criterion	X	X	X		X	X		X		X
Aptitudes to be Considered for Trial Norms	G		N		P	Q				M

Trial norms consisting of various combinations of Aptitudes G,N,P,Q and M with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1001 norms consisting of P-70,Q-75 and M-90 had the best selective efficiency. Equivalent B-1002 norms are P-79, Q-80 and M-85.

VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 34 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between B-1002 norms consisting of Aptitudes P, Q and M with critical scores of 70, 80 and 85, respectively, and the dichotomized criterion for Processor, Solid Propellant 6-52.773. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Processor, Solid Propellant 6-52.773
(P-70, Q-80, M-85)

N = 59	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	32	39
Poor Workers	15	5	20
Total	22	37	59

Phi Coefficient = .558
χ^2 = 18.349
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes P, Q and M with minimum scores of 70, 80 and 85, respectively, have been established as B-1002 norms for Processor, Solid Propellant 6-52.773 The equivalent B-1001 norms consist of P-70, Q-75 and M-90.

IX. Determination of Occupational Aptitude Pattern

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 35 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.